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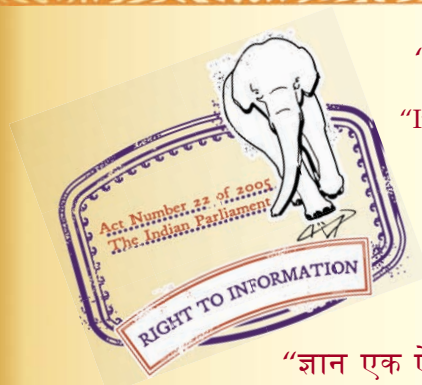
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Jawaharlal Nehru

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IS 7363 (1993): Inland vessels - Test and trials for harbour tugs [TED 18: Inland, Harbour Crafts and Fishing Vessels]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

अन्तर्देशीय पोत — बंदरगाह कर्ष — परीक्षण और परख

(पहला पुनरीक्षण)

Indian Standard

INLAND VESSELS — TESTS AND TRIALS FOR
HARBOUR TUGS

(*First Revision*)

UDC 629'12-72 : 621'89

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 2000111

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Shipbuilding Sectional Committee had been approved by the Transport Engineering Division Council.

This standard lays down tests to be carried out on harbour tugs and was issued in 1974. The present revision of the standard has been taken to align the standard with the current trade practices.

With the increase in size of both tankers and bulk carriers and the advent of specialized ships requiring a short turn around time, it has become necessary to increase the port facilities to meet these requirements. This directly makes it apparent that reappraisal of the requirements of the harbour berthing tug is a necessity, developments are under way to equip some of the larger tonnage ships with special devices for manoeuvring and berthing. These special devices are only complementary to the berthing tugs.

The word 'tug' is now used universally in the material handling world to cover units for pushing or towing and these units are readily adapted to suit specialized application.

Nowadays when there is a wide variety of tugs available for selection, a basis for assessing their performance for acceptance will be extremely helpful to tug owners.

The composition of Committee responsible for the preparation of this standard is given at Annex A.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

INLAND VESSELS — TESTS AND TRIALS FOR HARBOUR TUGS

(*First Revision*)

1 SCOPE

1.1 This standard lays down tests to be carried out on harbour tugs for assessing their performance for acceptance.

2 TESTS BEFORE CONSTRUCTION

2.1 Hull Model Test

Hull model test shall be carried out (unless/otherwise guaranteed by the builder, based on the proven hull form) in any of the approved experiment tank to:

- a) confirm the sufficiency of the prime mover with the hull proposed, to obtain the required/specified free running speed and bollard pull on trials under the limiting condition of draught and displacement proposed and also to consider minor modifications in form likely to increase propulsive efficiency, if necessary, taking into account operations in restricted depths of water.
- b) determine the most suitable form of bilge keels and the positions at which they shall be attached to the hull, to reduce the power absorbed to a minimum.
- c) confirm that the propeller proposed is satisfactory under the light and loaded conditions specified for speed as well as static bollard pull.

2.2 Hydrostatic Data

The following information regarding displacement shall be obtained before the construction is started:

- a) Estimated draught of the tug, with maximum allowance of + 50 mm.
- b) Trim diagram to arrive at actual displacement and draught before and after in service conditions.
- c) Hydrostatic curve showing the displacement scale, with curves of tonnes/cm, moment to change trim, longitudinal centre of buoyancy and flotation and vertical and longitudinal position of metacentre and also the co-efficients.

3 Test During Construction

3.1 Test certificates for materials used in the

construction of tugs shall be produced by the builder to the inspecting authority if so required by the purchaser.

3.2 If desired by the purchaser, the builder shall ensure that the machinery and the equipment installed on the vessel are duly certified to be in conformity with the requirements of statutory authorities and classification societies.

4 TESTS AFTER CONSTRUCTION

4.1 Inclining Experiment

Soon after the completion of construction of the tug, the builder shall carry out an inclining experiment in the presence of the owner's representatives and representative of statutory authorities. The experiment shall be carried out in fair weather and in calm water, preferably in sheltered waters or docks, the tug so placed as to avoid any effects of the wind and waves on the inclination of the vessel. During the experiment, all tanks shall be emptied or accounted for and the bilge shall be dry and no loose weights or materials, liable to shift, shall be on board except the inclining weights and righting weights which may be required to correct any list before the commencement of the inclining experiment. A careful check shall be made of the weights used and a complete record of all the weights including the number of persons on board the vessel, during the experiment shall be maintained. Based on the results of this inclining experiment and the hydrostatic data as per 2.2(c), the builders shall supply the final stability curves (stability booklet including cross curves of stability).

5 DOCK TRIALS

5.1 Before the tug leaves her moorings the deck for basins trials shall be carried out as follows:

- a) Main and auxiliary machinery running easy for 4 hours for testing, adjustment, flushing of pipe system, etc;
- b) Auxiliary generator and compressor unit running for two consecutive hours, carrying out specified duties satisfactorily; and
- c) Testing of electrical installations including main and auxiliary generators.

5.2 The following trials may be conducted in lieu of trials indicated in 5.1:

- a) Main engine run at 20 percent load;
- b) Diesel generator trials consisting of:
 - i) performance trials at:
 - 30 percent full load — 1/2 h
 - 50 percent full load — 1/2 h
 - 80 percent full load — 1 h
 - 100 percent full load — 2 h
 - 110 percent full load — 2½ h
 - ii) Governor test
 - iii) Overload trip test
 - iv) Testing of paralleling equipment including reverse current protection.
- c) Auxiliary units like pumps, compressors, centrifuges shall be run for 1 h (or as agreed upon to carry out specified duties satisfactory,
- d) Steering trial consisting of checking of:
 - i) The operation of the gear and its change-over arrangement.
 - ii) Synchronisation of rudder indicators.
- e) Warning devices.

6 HARBOUR TRIALS

6.1 Bollard Pull Trial

The bollard pull test shall be carried out in still water with the dynamometer secured to bollard by chain and resting on a smooth surface, preferably a steel plate. Length of the tow rope shall be according to requirements. Dynamometer readings shall be carefully recorded. Pull shall be recorded at four engine settings of 70, 80, 90 and 100 percent of specified full load, for specified rpm at full speed the vessel shall swing over from one side to the other until the tow rope is at least 40° on either quadrant. A duration of two minutes shall be taken for each pull with one minute interval in between. The quick release mechanism shall be demonstrated as well as any other tests as deemed necessary by the purchaser's representatives present at the trials. Dynamometer shall be calibrated before and after the trials.

6.1.1 Similar tests shall be carried out for ahead pull. All engine driven auxiliaries which normally run shall be operated during bollard trial.

6.2 Auxiliary Engine Trial

All auxiliary engines shall be tested for continuous running at full power as follows:

- a) Main and auxiliary generator and compressor sets, six hours continuous running during which records shall be made of full connected load temperatures, overload release, speed and load regulation.

- b) At the termination of the generator tests the insulation resistance of the wiring throughout the vessel shall be checked to ensure compliance with requirements.
- c) Fresh water and sanitary systems shall be thoroughly tested over a period of two hours.

7 SEA TRIALS

7.1 Main Engine Testing

This test shall be carried out as follows:

- a) Six hours at continuous rated BHP complete with fluid couplings, gear boxes and controls;
- b) One hour at 10 percent overload immediately following eight hours test;
- c) Governor, between minimum rpm to rated rpm and by throwing off load; and
- d) rpm at which overspeed trip operates shall be recorded.

7.2 Auxiliary Set Testing

The main and auxiliary generator, hydraulic pump and compressor sets shall be tested as complete units with generator, air compressor and hydraulic pump running simultaneously.

Derating of diesel engines shall also be effected in a similar manner to the main engines.

These tests shall include:

- a) six hours at continuous rated power,
- b) half an hour governor test,
- c) overload trip to be tested; and
- d) testing of parallel equipment including reverse current trip.

7.2.1 All main auxiliary equipment shall be run during the test.

7.3 Speed Trial

The speed trials shall be carried out in the specified loaded condition soon after the completion of the harbour trials and shall consist of:

- a) four runs over an approved measured distance at 80 percent power, two runs with and two runs against the tide; and
- b) four runs over an approved measured distance at full power, two runs with the two runs against the tide.

7.4 Manoeuvring and Turning Trials

The diameter of the turning circle shall be measured at the maximum speed under 35° of helm both port and starboard. The builder shall provide all necessary

instruments for the accurate plotting of the turning circle. The time taken for one complete turning circle each way shall be recorded. Turning circle diameter shall not exceed two and a half lengths. Manoeuvring time for the following operations shall be carefully measured and recorded at loaded conditions. In case of twin screw tugs, the effect on turning/manoeuvring by running either of the screw shall also be recorded. Angle of heel during the turning trial shall also be recorded:

- a) Ship steaming full speed ahead and the engine rest telegraph pull to full astern:
 - 1) time taken to stop engines,
 - 2) time taken to reverse engines,
 - 3) time taken for engines to reach full astern,
 - 4) time taken for vessel to stop,
 - 5) time taken for vessel to gain sternway for stationary position, and
 - 6) time taken for vessel to gain full sternway from stationary position.

Engine shall be kept at full astern for 15 minutes during which time the effect of the helm upon steering shall be tested.

- b) On completion of 15 minutes in the astern condition, the procedure shall be reversed and records similarly taken at given in (a) above.
- c) Manoeuvring trials using the propellers shall be carried out and the diameter of the turning circle measured, along with the time taken under different conditions as considered necessary by the purchaser's representative.
- d) Ability of the vessel to maintain a straight course both in 'ahead' and 'astern' conditions, without using the rudders shall be tested. It may be waived out for river run.

7.5 Steering Trials

With the vessel steaming full speed ahead, time required for the following operations of the helm shall be recorded:

- a) Midships to hardover starboard,
- b) Hardover starboard to midships,
- c) Midships to hardover port,
- d) Hardover port to midships,
- e) Hardover port to hardover starboard,
- f) Hardover starboard to hardover port, and
- g) Emergency steering/auxiliary steering controls to be tried to satisfaction.

The timings recorded for the above operations shall conform to the statutory regulations.

With the vessel at full astern, in which condition the rpm shall be at two-thirds of rpm at full speed ahead, the procedure mentioned above shall be repeated.

7.6 Anchoring Trials

The anchoring test shall be carried out as follows:

- a) Lower starboard anchor to water line and let go four lengths of cables (110 m) using the hand-brake.
- b) Lower port anchor to water line and let go four lengths of cables (110 m) using the hand-brake.
- c) Heave two lengths of port anchor cable. The average speed for this operation shall not be less than 9 m per minute.
- d) Heave remaining two lengths of both anchors simultaneously. Note the time for this operation and the average speed assessed shall not be less than 9 m per minute.

NOTE — The depth of water may not permit full suspension of the anchor and cable during the tests, in which case the requirements shall be agreed to between the purchaser and the builder.

7.7 Endurance Trial

One to and fro endurance trial trip shall be carried out between two points as agreed to between the builder and the purchaser. During the trial, the record of fuel consumption and temperature shall be maintained.

8 INSPECTION AFTER TRIALS AND TESTS

8.1 The vessel may be dry docked for thorough inspection, parts of the main and auxiliary machinery, fittings, etc, dismantled, if necessary, for inspection. All defects noticed during trials and subsequent inspection of the vessel shall be made good by the builder.

9 TESTING OF FIRE FIGHTING EQUIPMENT AND BILGE PUMPS

9.1 The following timings shall be recorded:

- a) Time required to pump at full pressure from receipt of order,
- b) Time taken to change over to alternate set of machinery; and
- c) Time taken to fit foam nozzles and deliver foam both for monitors and hoses.

9.2 Bilge pump shall also be tested for proper running.

9.3 Any other tests deemed necessary may be carried out as agreed to between the builder and the purchaser. Accessibility of all stores and equipment ladder may also be tested.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

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SHRI K. K. TIWARI (<i>Alternate</i>)	
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SHRI A. K. CHOPRA	Indian Register of Shipping, Bombay
SHRI S. DANDAPAT	Inland Waterway Authority of India, Noida (Dist. Ghaziabad)
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